

# CHP for Hospitals

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## Team Members

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*D & R International*

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*Avalon Consulting*

*American Gas Foundation*



# **CHP: Improving the Way Power is Produced & Energy is Used**

**CHP can help hospitals reach peak energy performance by lowering energy costs, ensuring power quality and reliability, and improving air quality and comfort.**

**Next six slides address the questions below to start you on your journey to discover how to get peak performance from your energy source.**

- **What is CHP?**
- **What Does a Typical CHP System in a Hospital Include?**
- **How Does CHP Improve Power Reliability?**
- **How Does CHP Save Energy?**
- **Why is There So Much Interest in CHP?**
- **Who Supports CHP System Installations and Why?**

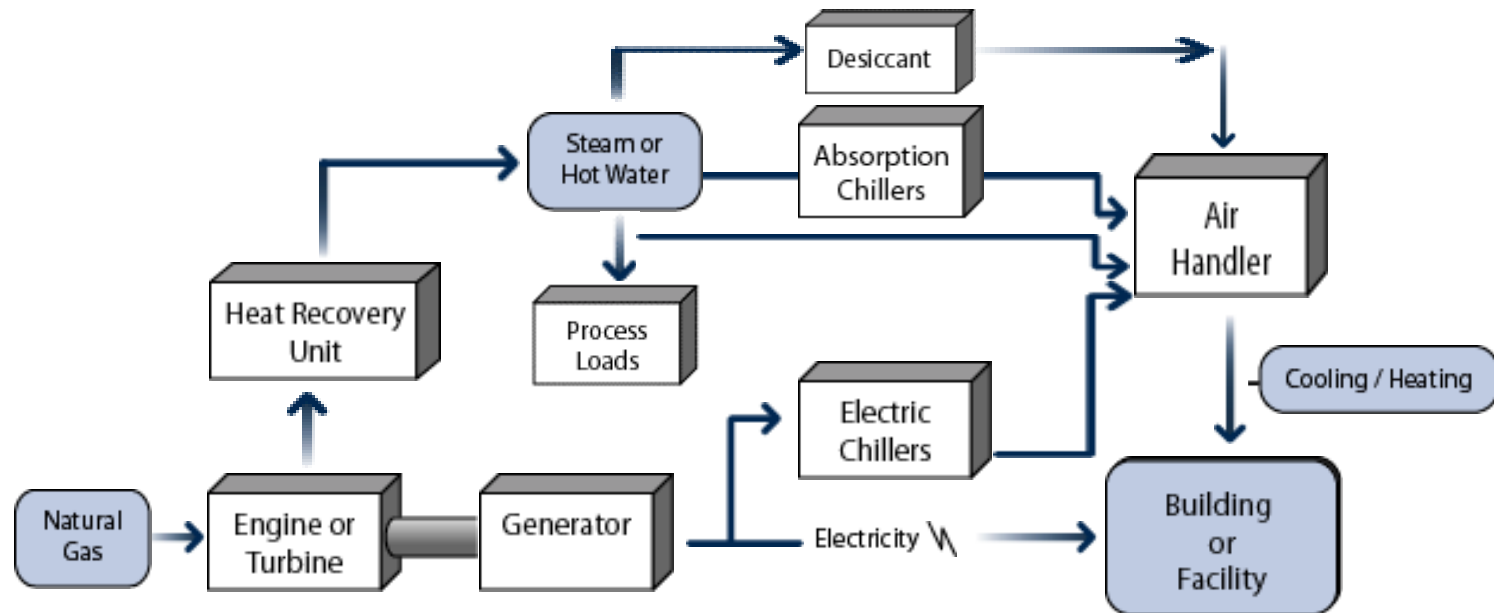


# What is CHP?

- **An Integrated Heating, Cooling, and Electric Power System**
- **Located On-Site or Near a Building/Facility**
- **Supplies a Portion of the Total Electrical Load**
- **Recovers the By-Product Heat from Generating Electricity to Provide the Facility with:**
  - Space Heating/Hot Water/Steam
  - Space Cooling
  - Dehumidification
  - Heat for Processes (e.g. Sterilization and Cooking)



# What Does a Typical CHP System for a Hospital Facility Include?



# How Does CHP Improve Power Reliability?

- **Normal Supply Power**

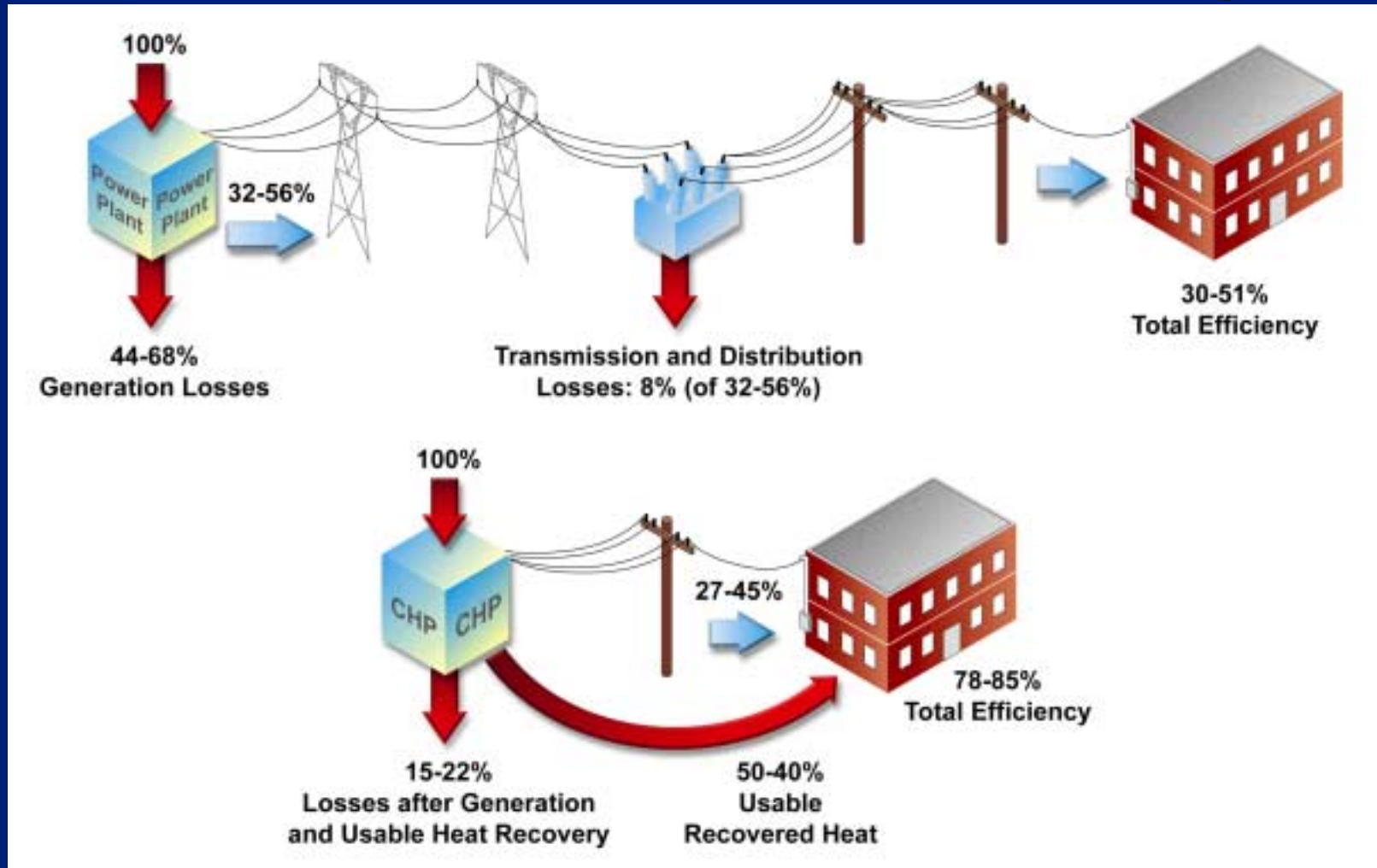
Since CHP is Located On-Site, Outages and Momentary Interruptions Caused by Utility Line Switching or Problems, are Eliminated when the CHP System is Operating.

- **Emergency Power** (*Life Safety, Critical, and Essential Equipment (per NFPA 70))*

– An Operating CHP System is the Primary Power Supply. The Utility Grid is the First Backup, with the Emergency Generators Providing a Second Backup.



# How Does CHP Save Energy?



# **What is Generating the Recent Interest in CHP?**

## **1. Improved Electric Power Reliability and Income**

**Disruption of Electrical Power Costs End-Users Time and Money**

## **2. Improved Business Case**

**Energy Savings through Energy Efficiency, Diversity of Energy Supply, and Low Cost Financing Options**

## **3. Improved Grid Security**

**Supports Weak Transmission / Distribution Areas and Disperses Electrical Generation so that the Threat to National Grid System is Reduced.**

## **4. Increased Energy Efficiency and Fuel Resource Conservation**

**Conventional Central Electrical Plants are About 33% Efficient while CHP Systems are Up to 85% Efficient**

## **5. Reduced Environmental Impacts**

**Higher Efficiencies Mean Less Fuel Used and Thus, Lower Emissions**



# Who Supports CHP System Installations and Why?

- U.S. Department of Energy – Office of Distributed Energy Resources
  - High Energy Efficiencies
  - Reduced Fuel Use
  - Less Reliance on Foreign Oil
  - Lower Emissions
- U.S. Environmental Protection Agency
  - Higher Efficiencies Mean Lower Emissions
- State Energy Agencies
  - High Energy Efficiencies
  - Reduced Fuel Use
  - Lower Emissions



*Check with Your Local,  
State, and Federal Agencies  
for Potential Funding  
Opportunities and Incentives*



# **Today More than 200 Hospitals are Benefiting from CHP**

**Hospitals are prime candidates to benefit from CHP. They demand the best for their patients and staff, and expect the best from their energy sources.**

**Next ten slides address the questions below to continue your journey to discover how to get peak performance from your energy source.**

- How Can CHP Benefit Hospitals Today?**
- Why are Hospitals Good Candidates for CHP?**
- How Much Will a CHP System Cost?**
- What Payback Can I Expect on a CHP System?**
- What Kind of Hospitals Have CHP Today?**
- What Kind of Hospitals Have CHP?**
- Where are the Hospitals Using CHP Located?**
- Where Can I Get Free Preliminary Evaluation of CHP?**



# How Can CHP Benefit Hospitals Today?

- Reduce Energy Costs
- Eliminate / Reduce Momentary Outages and the Problems and Costs Associated with Them
- Provide Backup Electricity for Emergency Loads
- Supply Backup Cooling During Electric Power Outages
- Enhance Power Quality
- Offer Energy Flexibility and Reduce Exposure to Energy Price Volatility
- Improve Environmental Quality



# **Why are Hospitals Good Candidates for CHP?**

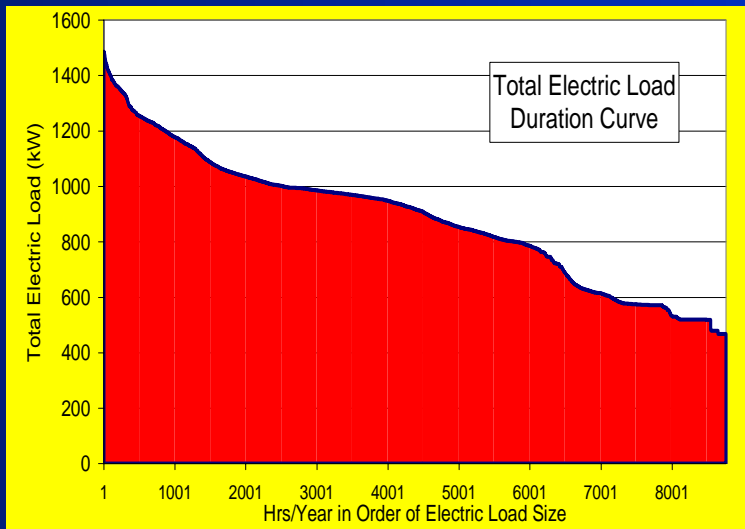
- **Need Electricity in Tandem with the Need for Space Heating/Cooling**
- **Relatively Level Electrical Use 24/7/365**
- **High Power Reliability is Important**
- **High Power Quality is Important**
- **Relatively High Energy Use per Square Foot**



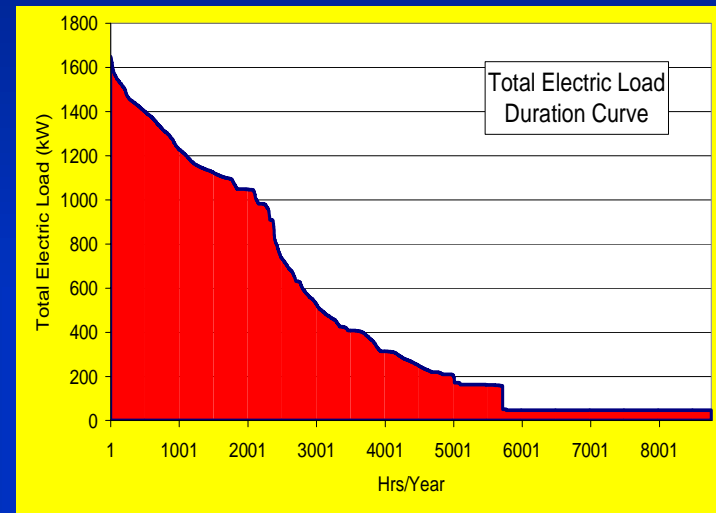
# Why are Hospitals Good Candidates for CHP? *(continued)*

Hospital Power Consumption is More Constant than Other Commercial Loads

Hospitals Have a Greater Opportunity for CHP Due to the More Consistent Electric and Thermal Loads



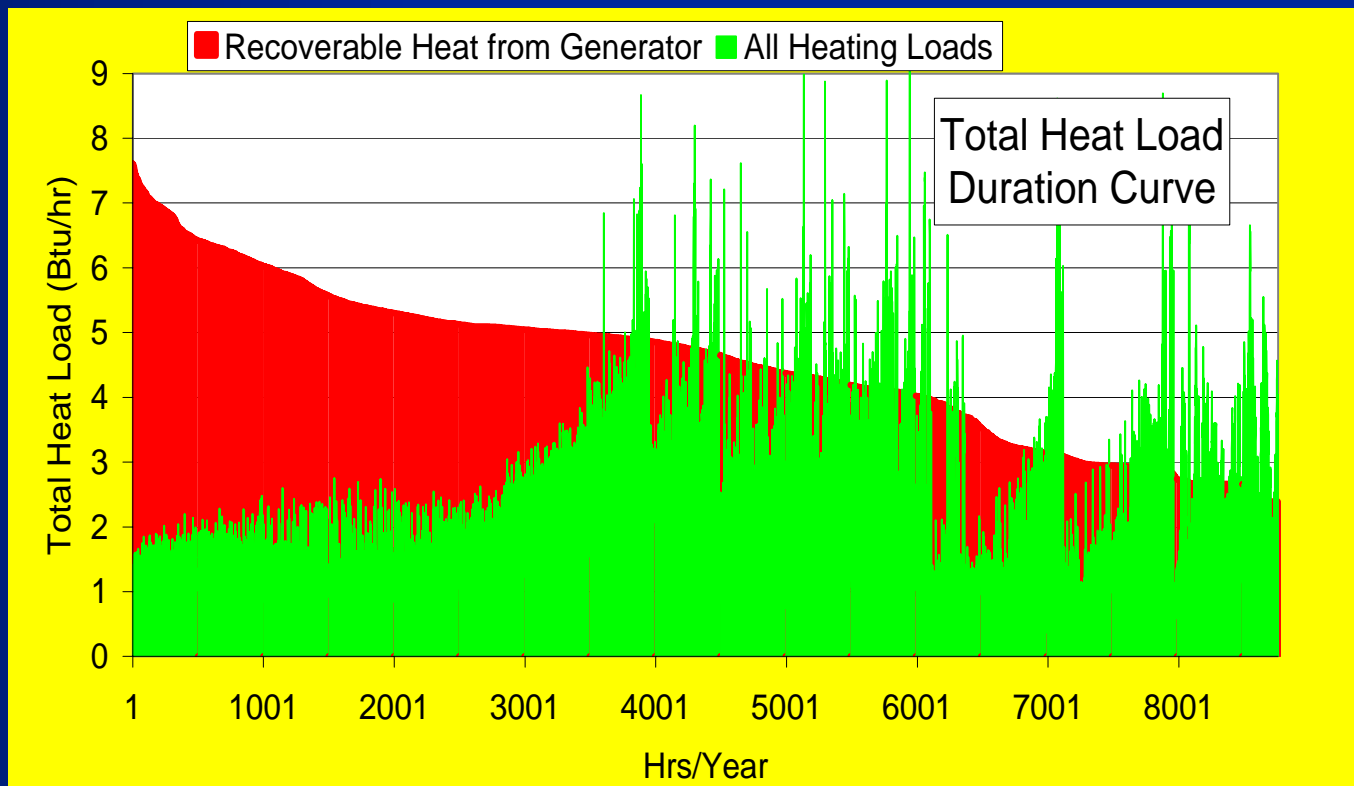
**Hospital 300,000 Ft<sup>2</sup>**



**Office Bldg 300,000 Ft<sup>2</sup>**

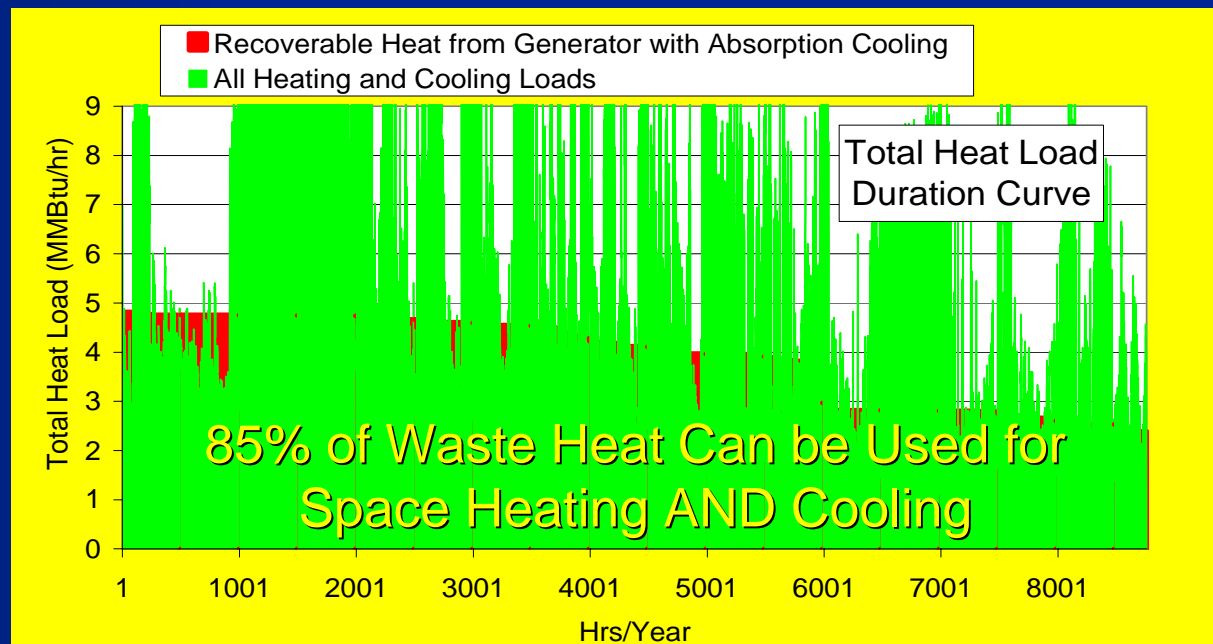
# Why are Hospitals Good Candidates for CHP? *(continued)*

Typical Heat Generation Profile from a Natural Gas Engine in a Chicago Area Hospital – Overlay of Hourly Heat Demand from January to December  
42% of the Available Rejected Heat from the Natural Gas Engine is Used



# Why are Hospitals Good Candidates for CHP? *(continued)*

## Hospitals Need Lots of Cooling Too!



- Mix of Electric and Absorption Chillers is Used to Avoid Excessive Boiler Operation
- Heat Rejected by the Generator is Only Useful to the Extent that it Coincides with a Load Capable of Using It.



# About How Much Will a CHP System Cost?

- **Installed Costs are Generally Between \$800 to \$1,800 per Kilowatt**
  - **Includes Cost of**
    - » Generator / Switchgear
    - » Heat Recovery Equipment
    - » Single-Effect of Absorption Chiller
    - » Equipment Installation Costs
  - **Does Not Include Credit for Displaced**
    - » Electric Chillers
    - » Boilers / Hot Water Generator
- **Larger Size Systems Cost Less per Kilowatt**
- **Properly Sized CHP Systems Increase in Cost at a Slower Rate as Building Size Increases (Economies of Scale)**

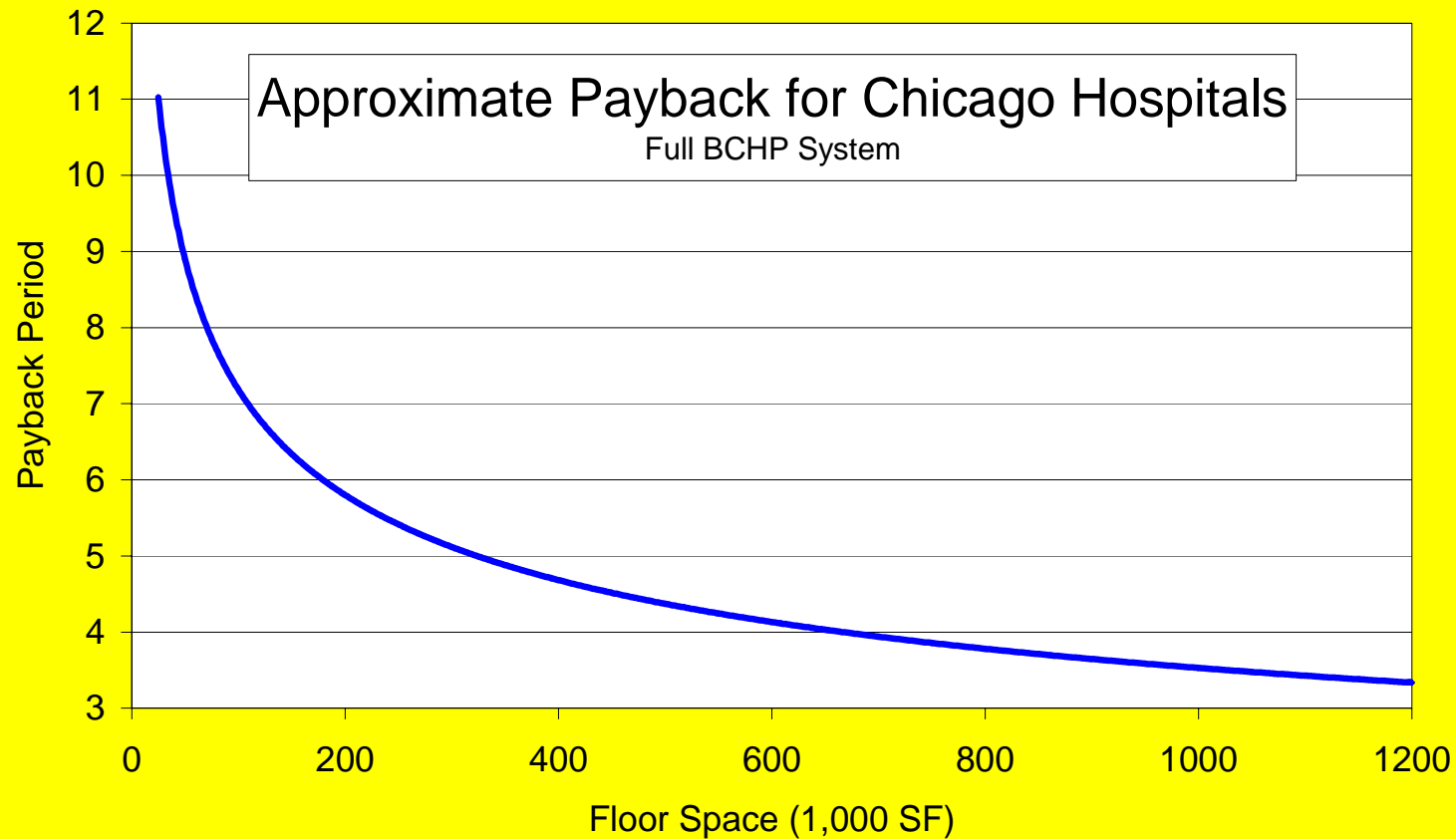


# **What Payback Can I Expect on a CHP System?**

- **Important to Size System Properly to Get Fastest Payback**
- **Generally Payback is 3 to 8 Years in Large Metropolitan Areas (Where Electric Costs are Higher)**
- **Larger Hospitals with Larger Systems Experience Faster Paybacks**



# What Payback Can I Expect on a CHP System? *(Example)*



# What Kind of Hospitals Have CHP Today?

*Advocate South Suburban Hospital*

*Beloit Memorial Hospital*

*Children's Hospital*

*Hospital in Washington State*

*Lake Forest Hospital*

*Little Company of Mary Hospital*

*Northwest Community Hospital*

*Presbyterian Homes*

*Resurrection Hospital*

*St Francis Hospital*

*University of California - Davis Medical Center*

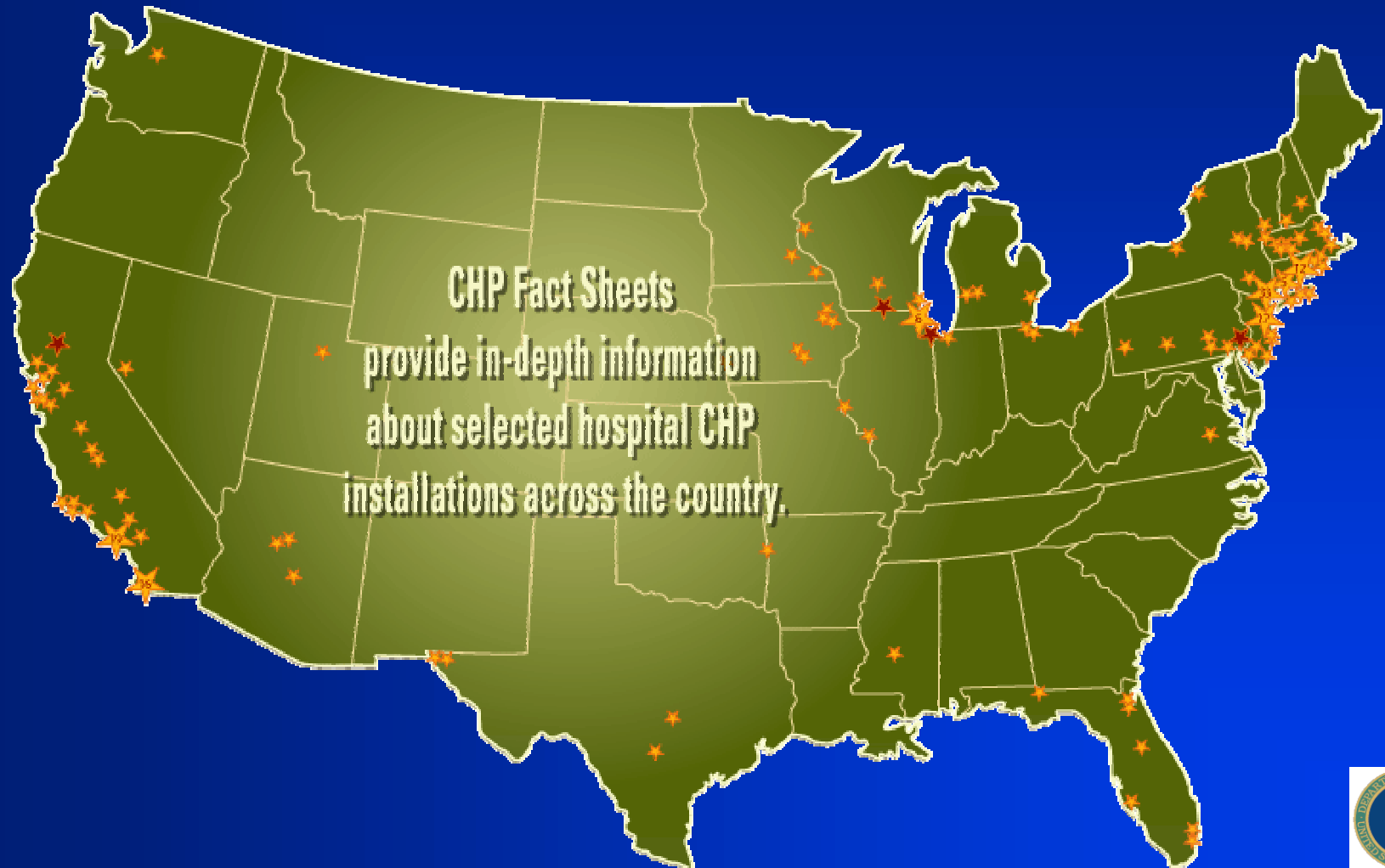
- **All Kinds!**

**Here are a  
few examples**



# Where are the Hospitals Using CHP Located?

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# Where Can I Get Free Preliminary Evaluation of CHP Application in My Hospital?

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- The U.S. DOE supports a program to perform the first-level screening analysis for CHP applications in hospitals at no cost to you
- Send your hospital information in a form that you can download at <http://www.bchp.org/prof-assessment.html#form> or Contact Jan Berry at Oak Ridge National Laboratory: [berryjb@ornl.gov](mailto:berryjb@ornl.gov)

